



Moab Salt, Inc.

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November 20, 1989

Mr. Don A. Ostler
Executive Secretary
Utah Water Pollution Control Committee
Department of Health
P. O. Box 16690
Salt Lake City, Utah 84116-0690

Re: Revised Conceptual Plan
November 10, 1989

Dear Mr. Ostler:

Please find enclosed a revised Conceptual Plan as per your request dated October 2, 1989 and subsequent meeting with Mr. Loren Morton on October 13, 1989. We do not understand how a conceptual plan can be "inadequate" as so stated in your October 2 letter. As discussed in our original meeting on June 7, 1989, Moab Salt would prepare a plan as a starting point to generate ideas that would guide both parties in formulating a mutually acceptable, cost effective working program. Our August 10 plan and this revision of it are intended as working documents. At such time as both parties are in agreement as to all phases of the Conceptual Plan, then Moab Salt will implement it as an approved program. We want to resolve any outstanding issues with the BWPC on our Mining and Reclamation Plan in a reasonable manner just as we have with the Division of Oil, Gas and Mining.

We would encourage a quick response to this most recent revision in order for us to initiate the program before the end of 1989. If there are any questions or items that require further clarification, please feel free to contact us.

Sincerely,

E. K. York

E. K. York
General Manager

EKY/mp
Enclosure

cc w/enclosure: D. C. Edmiston
O. W. Gushee, Jr.
C. A. Tapp

CONCEPTUAL PLAN
STUDY OF THE POTENTIAL SALT LOADING
ON LOCAL HYDROLOGY
MOAB SALT, INC.

REVISED NOVEMBER 10, 1989

MOAB SALT, INC.
MOAB, UTAH

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INTRODUCTION

Contained herein, and submitted to the State of Utah's Bureau of Water Pollution Control, is a proposed conceptual plan to evaluate and identify areas within Moab Salt, Inc.'s plant near Moab, Utah which may have the potential of releasing salts into the hydrologic system. This conceptual plan is to provide the basis for beginning a meaningful dialogue and working relationship with the BWPC in order to address concerns voiced by that agency during the review of Moab Salt, Inc.'s Mining and Reclamation Plan approved by the Utah Division of Oil, Gas and Mining. Even though the plant is subdivided into two different sites and the BWPC has discussed concerns at each location, the company feels that all concerns can be addressed by investigating and evaluating two major topics and formulating a program which would define any potential problem, evaluate the scope of the problem and then work out acceptable, reasonable solutions. The first topic focuses on potential increases in salt loading of surface runoff from the operation while the second deals with potential salinity increases in the local ground water system.

The conceptual plan presented on the following pages will provide a preliminary step in understanding what is happening with regard to the surface water and ground waters. It is only meant as a starting point and future actions will depend on the results obtained during this study phase.

2.0 STORM WATER RUNOFF CHARACTERISTICS

In our June 7, 1989 meeting with the Bureau of Water Pollution Control, we discussed the questions of whether or not storm water runoff in the plant area may be picking up salts. However, the data required to make such a determination are not available. This conceptual plan proposes to initiate a program for the collection and evaluation of local data. Historical data collected by the U. S. Geological Survey, EPA and the company on the Colorado River will add to the understanding of local conditions. The following sections briefly discuss the major concepts of this part of the program, while Table I proposes a general timetable which could be used for this phase.

2.1 - Sampling Points

To fully understand the contribution of local geologic conditions and any conditions attributable to the plant, control samples must be part of the overall program. Therefore, sampling points will be of two types; first will be those from which "control" samples will be taken. The second type will be that set which by their close location to the plant would show any increase in salts due to the plant. It must be understood that worker safety is a primary concern. Runoff in such a desert environment can quickly become dangerous and collecting a sample does not outweigh the worker's safety. The quality of the resulting sample could not be guaranteed.

Figure 1 shows the location of current sampling points on the Colorado River. Ephemeral drainages on the west side of the river and reasonably close to the plant site are highlighted in blue. It is the intent of the "control" sample to collect storm water runoff from those drainage areas before it reaches the plant. The sample may not exactly represent a runoff sample from the plant area if the plant had not been built. Local geology and hydrology are not the same, but it will be close.

Sample sites #1, 2, 3, 4, 5, 8 and 10 represent potential locations for the control set, while sites #6, 7 and 9 indicate those sites which could represent storm water runoff from the plant site. All sites must be field checked. It is possible that during this process one or more would be relocated to a better position or rejected as a sampling point. Once the sites are chosen, the necessary sampling procedures would be established by the company. Analyses would be as follows:

1. Field:

- | | |
|---------------|------------------|
| . Temperature | . Estimated Flow |
| . pH | . Conductivity |

2. Laboratory:

- | | | |
|--------------------------|---------------|------------|
| . Sodium | . Magnesium | . Chloride |
| . Potassium | . Carbonate | . Sulfate |
| . Calcium | . Bicarbonate | |
| . Total Dissolved Solids | | |
| . Total Suspended Solids | | |

All collected data would be kept at the plant site and reported to the State quarterly.

2.2 Local Precipitation

Precipitation events can be widely scattered and of varying intensities. In order to quantify the amount of moisture received at the evaporation ponds and the plant site, it is proposed to establish rain gauges at each location. Measured precipitation, soil conditions and aerial extent of drainage basins can then be used to calculate the runoff volume. As our knowledge base increases, a direct correlation between precipitation and runoff can be made for each area.

2.3 Evaluation of Historical Data

A significant amount of water quality data is available on the Colorado River. Sources include the U. S. Geological Survey, the EPA and Moab Salt, Inc. To aid in understanding if any salts from the plant are entering the hydrologic system, the data will be statistically evaluated, using accepted industry standards.

Since potassium is the major element being produced and sodium is closely associated, all efforts will be directed toward the evaluation of potassium and its distribution. Other parameters will also be reviewed. This study will add to the overall knowledge.

2.4 Local Springs

Several small seeps and springs are present in the "study" area. It is proposed that all springs near the proposed surface

runoff sampling points Nos. 1 and 10 be inventoried. Those which produce enough flow for sampling will be sampled on a quarterly basis. These samples will be analyzed for the same parameters as shown above, Section 2.1. Sampling will continue until such time as it is determined that enough background data for the springs/seeps has been collected. This information will aid in understanding of background water quality.

2.5 Reporting

All sampling for storm water runoff characterization will be done on a calendar quarter basis with appropriate reports being submitted to the Bureau of Water Pollution Control no later than 30 days following the end of each quarter, as per the following schedule:

<u>Calendar Quarter</u>	<u>Submittal Date</u>
#1 January-March	April 30
#2 April-June	July 30
#3 July-September	October 30
#4 October-December	January 30

2.6 Characterization of Data and Development of Alternate Plans

All of the above data for a period of at least two years will be compiled and evaluated. Moab Salt, Inc.'s operation is located in arid southeastern Utah with annual precipitation from 1936 through 1965 averaging 8.26 inches. A two-year program is proposed in order to collect statistically valid, seasonal background data. It is possible that very little usable information could be collected during this time frame. At the end of that time frame or at any point during the two-year study period when the collected data clearly indicates that runoff does not meet guidelines established by the Colorado River Salinity Forum, the company will then develop a program using Best Available Technology, BAT, which is cost effective to bring any area(s) into compliance, as per the applicable regulations. This will include, but not be limited to, any design changes that may be necessary for the Mobley Dam. If it is determined that no problem exists, then no further action will be taken.

Table I proposes a time schedule for the Conceptual Plan.

It would be initiated once the BWPC approves the plan. Even though the company is proposing a two-year program, notice that work in each major category begins with that approval.

3.0 GROUND WATER CHARACTERIZATION

It is the contention by the BWPC that some brine solutions from the evaporation ponds and the brine storage lake are adding salt to the Colorado River. Neither the company nor the BWPC has such data to support this premise. It will be the purpose of this part of the proposed conceptual plan to evaluate two plant areas.

3.1 Water Balance

The company's position in determining a water balance in the past has been one of reluctance because of the inherent errors associated with measuring devices. We understand BWPC's need to quantify a water balance. However, this does not change our position. We are proposing a method to review the water balance in the brine storage lake and the evaporation ponds which could indicate the presence or absence of any significant leaks.

Therefore, the company proposes to review the water balance for those two locations based on the following formulas.

Evaporation Ponds

Estimated Gain/Loss = (Metered Gallons In + Adjusted Precipitation) - Evaporation

Brine Lake:

Estimated Gain/Loss = (Metered Gallons In + Adjusted Precipitation + Brine Lake Level Adjustments) - (Evaporation + Metered Extraction)

Evaporation rates used by the company will be a 19-year adjusted average as determined by the Utah State climatologist.

Water balances will be calculated in terms of a range, with each factor of uncertainty explained; i.e., accuracy of flow meters, brine lake level adjustments, evaporation rates, etc.

The volume of the brine lake will be calculated using accepted industry standards for volume calculations.

Brine lake elevation adjustments are defined as the net gain or loss in gallons as measured by elevation differences of the lake from January to December of each year.

If the calculations above indicate that evaporation rates exceed the input into the ponds or lake, no further work will be necessary. However, if the opposite is true, more detailed "balance" determinations will be instituted for a more reliable quantification of any leaks. Studies would then be outlined to identify and locate any areas of leakage. Once identified, the company would then develop a program using Best Available Technology which is cost effective to remedy the problem.

3.2 Canyon Collection

The canyon collection system was installed at some unknown time in the past. The company is in the process of renovating those facilities which have been in a state of disrepair. This system can be divided into two groups; first being the surface impoundment structures in the upper and lower canyons around the evaporation ponds and the second group consisting of a series of collection sumps in the porous alluvium in Canyon #4. Reactivation of these two systems is meant to be an interim measure to collect any leakage until the source of the problem can be identified and repaired. These systems will remain operational until such time as any pond leaks can be identified and repaired and regardless of the outcome of the water balance performed around the evaporation ponds.

As determined by the cooperative efforts between the company and the BWPC, one or more monitor wells will be installed below the Mobley containment structure. All appropriate permits for operating the monitor wells will be obtained prior to installation. The purpose will be to evaluate any potential subsurface flow of brine occurring below the canyon collection system. During startup of the monitor wells, the wells will be monitored weekly for the first month, then monthly for two months after which all samples will be taken on a quarterly calendar basis, see Section 2.5. Monitoring will consist of measuring groundwater levels and sampling the water quality for the following parameters:

1. Field:
 - . Temperature
 - . pH
 - . Conductivity

2. Laboratory:

- | | | |
|--------------------------|---------------|------------|
| . Sodium | . Magnesium | . Chloride |
| . Potassium | . Carbonate | . Sulfate |
| . Calcium | . Bicarbonate | |
| . Total Dissolved Solids | | |
| . Total Suspended Solids | | |

Any future work will depend upon the results provided by this system after two years of collected data has been evaluated or at any point where the collected data clearly indicates that it does not meet the applicable standards. The company will then develop a program using BAT which is cost effective to bring the area into compliance with then applicable regulations.

As per your question regarding the Mobley Dam design, no work will be done on design until the storm water runoff program provides sufficient data. Any discussion regarding the Mobley Dam is to be part of the storm water runoff characterization, Section 2.0.

3.3 Evaporation Ponds

The BWPC has in the past requested that Moab Salt conduct a water balance on various parts of its system. The company can only assume that the intended purpose is to determine if any leaks are present and their relative magnitude. By performing the water balance proposed in this "Conceptual Plan", the company believes it will accomplish the same end, i.e., confirm the presence or absence of any leaks and determine their relative size. Only by determining an order of magnitude for leaks from a system can the company and the BWPC develop a cost effective solution.

In this plan, the company has also proposed interim measures to collect any leakage which may occur from the evaporation ponds, Section 3.2. Depending upon the sufficiency of information, the relining of one pond per year could begin in 1990, pending upper management approval. The company will develop its sequencing of ponds to be relined based on water balances and any additional information it has on site plus economic criteria. Moab Salt will determine on an annual basis the necessity for relining and which pond will be relined during that calendar year using additional information gained from the preceding operating season. The annual relining

of an evaporation pond will continue until such time as all leaking ponds have been relined. This program will be initiated regardless of the outcome of the water balance performed around the evaporation ponds.

The original warranty provided by the manufacturer of Moab's pond liners was for 20 years. There are only a few liners in this country which exceed the length of service that Moab Salt's liners have had. Studies indicate that under certain conditions a liner's life could exceed 400 years. Most hypalon liners having greater than 25 years of service are "free of surface cracking or crazing," retaining $\pm 80\%$ of their original tensile strength and 90% elongation. Samples can be cut and sent out to the manufacturer for further testing. In addition, it has been the company's policy to perform ongoing maintenance on the liners. Repairing and replacing any obviously damaged areas since liner installation will also increase the life expectancy of the liner. Under these circumstances, it is probable that the pond liners could exceed an operating life of 50 years. By working with the manufacturer, Moab Salt can provide more information on liner life expectancy as part of the program once the Conceptual Plan has been approved.

3.4 Brine Lake

BWPC originally requested a water balance in order to determine if the brine lake was leaking but now takes the position that a water balance will not determine an "absence or presence of brine lake leakage in the subsurface." Moab Salt has proposed in Section 3.1 to perform a water balance in order to determine if any leakage is occurring and if so, its order of magnitude. The leakage occurring at the dam which is being recaptured may be all of the leakage that is occurring. A water balance could make this determination. As stated in the introduction, the company is proposing several programs which would first define any potential problem, evaluate the scope of the problem, then work out a reasonable solution. Currently, the engineered solution for the leakage at the brine dam may be all that is necessary, but until a water balance is completed, neither party will know. Mere speculation will be avoided by Moab's program.

If it has been determined that the brine lake is leaking, as outlined in Section 3.1 above, the company will attempt to locate and remedy any such leaks on a cost effective basis. The first

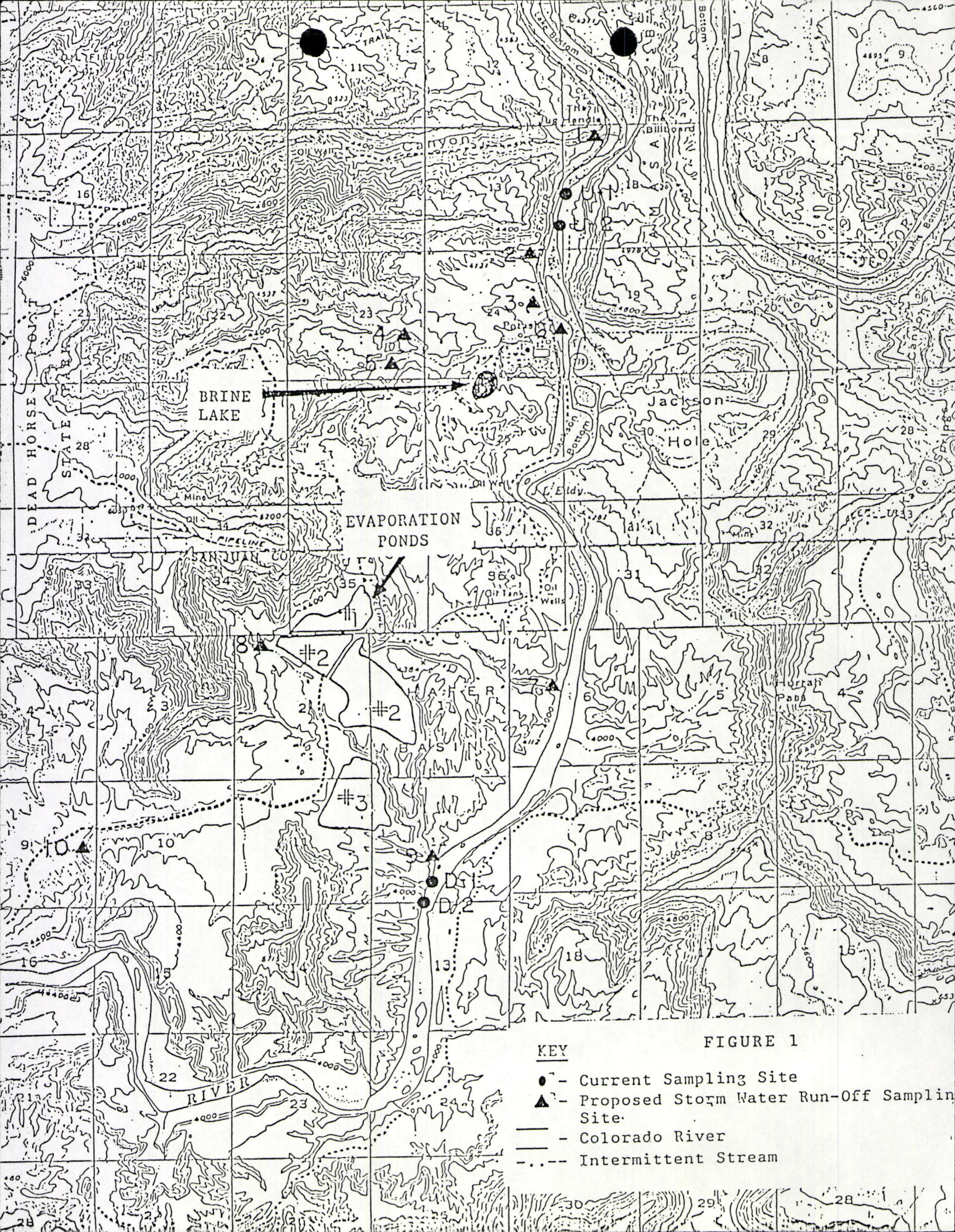
step would be to review and evaluate the original construction techniques used for the dam and lake bottom to determine the adequacy of construction. The company will evaluate the information and prepare a program to operate the ponds in an environmentally conscientious manner. Any area which may be leaking brine from the brine lake will be evaluated and the company will prepare a program to remedy the situation. Such a program may include an expanded VLF/EM survey of geologic structures under the brine lake, etc., as indicated by the need defined above.

As per your request for grouting information, Moab Salt submitted to the BWPC its grouting information on May 18, 1988.

4.0 SUMMARY

The company feels that concerns from the BWPC fall into two categories, potential salt loading of storm water runoff and possible salinity increases in the local ground water system. By first defining any problems and their order of magnitude, a course of action which correct these items using rational, cost effective programs can be determined.

The company has proposed a program which it feels is reasonable and addresses the concerns outlined in numerous correspondence with the BWPC since 1988. We are willing to discuss the plan in summary or individual aspects of it with the BWPC at any time and feel that a mutually agreeable program can be agreed upon when reasonably approached by both parties.



KEY

- - Current Sampling Site
- ▲ - Proposed Storm Water Run-Off Sampling Site
- - Colorado River
- - Intermittent Stream

FIGURE 1

